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counting. Merely to think of two things is at least to assert the universal operation of thought meant by the figure 2. Without this minimum of reference the statement $2 + 2 = 4$ is meaningless. Either the truths of mathematics and logic are principles of actual thinking or they are material entities. The latter supposition is meaningless. The former means that the principles of logic and pure mathematics are expressive of universal conditions of valid thinking in normal minds. If one's thought is to be normal and have a place in that consistent or systematic whole by which alone thought can validly mean reality, one must follow the condition of this common or over-individual thought-structure.

The reality of abstract truths, then, is a thought-reality, but not a mere psychological existence. Like all actual judgments, the judgments of mathematics are logical acts which transcend psychological existence and take their places in an organic and self-consistent system, which latter is the determining ideal that is, at least in part, actualized in the body of science. And the simplest hypothesis on which to ground the validity of this ideal system and by which to account for the common or over-individual thought-structure involved in all judgment will perhaps, after all, prove to be that of a general thinking consciousness. I do not advance this doctrine as the inevitable outcome of reflection on the basis of judgment, but simply to insist that it is a theory seriously to be reckoned with.

J. A. LEIGHTON.

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SOCIETIES

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY OF THE NEW YORK ACADEMY OF SCIENCES

REPORT OF THE SECRETARY

AT a meeting held in conjunction with the New York Section of the American Psychological Association, on the afternoon and evening of November 27, 1905, with Professor Woodbridge in the chair, Professor Robert MacDougall was elected Chairman for the coming year and Professor R. S. Woodworth Secretary. The following are abstracts of the papers read:

Smell Discrimination of Two Hundred and Fifty-five Students: WILL S. MONROE.

Students were provided with sets of small phials filled one third full of common odors,—chiefly essential oils. Each set contained

20 odors. Nostrils were alternately used; five seconds were given for the stimulation, and one minute was allowed for recording the result and resting the nostrils. After every seven tests, the windows were opened and the room aired. In all, 255 students were tested. The average number of odors correctly named was 6.72. Four students named 12 correctly; two students, 11; and 5 students, 10. Two of the students were able to identify but 1 odor each; 15 students, but 2 odors each; and 17 students, but 3 odors each.

Wintergreen was correctly identified by 77 per cent. of the students; camphor, 75 per cent.; peppermint, 75 per cent.; vanilla, 74 per cent.; cloves, 65 per cent.; cinnamon, 56 per cent.; spearmint, 38 per cent.; turpentine, 36 per cent.; tar, 36 per cent.; lemon, 30 per cent.; nutmeg, 27 per cent.; anise, 26 per cent.; pennyroyal, 21 per cent.; sassafras, 15 per cent.; bay rum, 9 per cent.; hemlock, 4 per cent.; bergamot, 3 per cent.; asafœtida, 2 per cent.; wormwood, 1 per cent.; and lavender, half of one per cent. A census of color names showed that the students believed themselves familiar with certain odors, such as lavender, which they were unable to recognize.

Linguistic Standards: FREDERIC LYMAN WELLS.

A historical standard is necessary for the regulation of linguistic usage, but the present literary interpretation of it is open to many objections, being reactionary in character and inconsistent in its admissions and exclusions. Models of linguistic excellence, as determinative of that body of elements to be considered good use, are to be sought among works whose criteria of value are more objective in character than is the case at present, as their value can be more rapidly and more accurately determined, and they are in closer touch with the actual needs of the language. The introspection of the author of the average 'Principles of Rhetoric' should not be accepted as final in determining the interrelationship of these elements of good use. It is possible to determine linguistic values of all sorts by statistical methods, which give not only the most valid determination possible, but also the measure of this validity. Determinations of so apparently subjective a character as linguistic force can be made with a validity that approximates practical certainty. These experimental determinations do not coincide with any of the definitions of force which the introspective grammarians have laid down.

Preliminary Report on 'A Threshold Study of the Reading Pause': F. M. HAMILTON.

Previous investigators of the problem of reading have agreed upon the short exposure method as best for psychological analysis. Introspection is facilitated most when the exposure is less than the shortest reading pause, *i. e.*, when all eye movements are excluded. The apparatus most generally used is the tachistoscope of the fall screen variety. The word has been uniformly treated as the unit of perception in reading, the effort being to determine the factors or 'cues' of word recognition—their character and order of occurrence.

Previous tachistoscopic studies have confined themselves chiefly to the reading of isolated words; the present study has attempted to adapt the method to reading in context.

A second adaptation is its use in analyzing processes at the threshold of word recognition by reducing the exposure time to a period approximating the time differences of the perceptibility of their attributes, the presupposition being that various attributes of objects lie at varying distances from the threshold.

And still a third untried possibility of this method consists in reports upon the marginal field of perceptual regard in addition to the reports upon the field of distinct vision.

The experiments have already proceeded far enough to give assurance that the completion of the study will shed additional light upon the questions of literal reading, reading cues, value of context, etc.

Vision and Localization During Rapid Eye Movements: R. S. WOODWORTH.

An attempt was made to throw some additional light on the question first raised by Cattell[1] as to what is seen during movements or jumps of the eye from one fixation-point to another. Two opposing views are those of Holt,[2] who holds to a complete anesthesia or inhibition of the visual center during the movement, and of Dodge,[3] who believes that vision there is possible but under ordinary conditions not actualized, because the faint blur produced by moving the eye across a variegated field is so brief and meaningless as to be ignored, just as entoptic phenomena are ignored. Proceeding on the supposition that if the latter view were correct it should be possible by attention and practice to become conscious of the stimuli that affect the eye during movement, the author has convinced himself of the following facts:

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[1] *Psychological Review*, 1900, VII., pp. 325–343, 507–508.

[2] *Ibid.; Monograph Supplements*, 1903, IV., pp. 3–45; *Psychological Bulletin*, 1905, II.

[3] *Psychological Review*, 1900, VII., pp. 454–465; *Psychological Bulletin*, 1905, II., pp. 193–199.

1. During head movements, an object held in the mouth may remain in clear vision.

2. During convergence, the two monocular fields may be seen to move across each other.

3. During eye-jumps proper, after-images may remain in consciousness if the lids are closed (Exner), or if the background is dark or plain; it is also possible, in short jumps, or at the beginning and end of longer ones, to see entoptic spots move across the background.

4. External objects moving in the same direction as the eye are distinctly seen when their angular velocity with respect to the eye coincides with that of the eye at any part of its jump (Cattell, Dodge). With reference to Holt's objection that what is seen may be the positive after-image, appearing after the eye has come to rest, it should be noted that the objects so brought to clear vision are correctly localized in space, instead of being projected against the background at the new point of fixation, as would be the case with after-images. Thus not only vision, but correct localization of objects seen, is possible during eye-jumps.

5. Stationary objects over which the eye passes can also be seen after practice. Fusion, flicker, and especially apparent motion of the objects, corresponding to the actual motion of their images across the retina, can all be seen. A peculiarity which calls for further discussion is that the apparent extent of the object's motion is much less than the actual motion of the eye as measured against the background.

The author's conclusion is that vision with the moving eye is essentially the same as that with the fixed eye when the external field moves.

The Measurement of Scientific Merit: J. McKeen Cattell.

The speaker explained how he had selected a group of one thousand scientific men for the study of individual differences and the conditions on which success in scientific work depends. In each of the twelve principal sciences the students who had done original work were arranged in the order of merit of their work by ten competent judges. Thus was obtained the order of merit and also the probable error of each position, it being based on ten independent observations. This probable error is inversely as the differences in scientific method, it being small where the differences are marked and becoming larger as the differences are less. It is thus possible to construct a curve representing the distribution of scientific merit in these thousand scientific men, and this curve agrees rather closely with the positive half of the curve of error. The first hundred men differ among themselves about as much as the next two hundred or the last seven hundred.

Data were also given in regard to the distribution of the thousand leading scientific men of the country. The birth-rate of these scientific men was 27 per million of the population, it being 50 in cities and 24 in the country. It was 109 in Massachusetts, 47 in New York, 23 in Pennsylvania, 12 in Missouri and 1 in Mississippi and in Louisiana. Their present distribution is somewhat similar. Thus 134 scientific men were born in Massachusetts and 144 reside there; 183 were born in New York and 192 reside there. The central states, with the exception of Illinois, tend to lose their scientific men. Thus 75 were born in Ohio, and 34 now reside there. The distribution of these scientific men among different institutions is as follows: Harvard, 66; Columbia, 60; Chicago, 39; Cornell, 33; U. S. Geological Survey, 32; U. S. Department of Agriculture, 32; Johns Hopkins, 30; California, 27; Yale, 26; Smithsonian Institution, 22; Michigan, 20; Massachusetts Institute of Technology, 19; Wisconsin, 18; Pennsylvania, 17; Stanford, 16; Princeton, 14; Minnesota and Ohio State, 10 each.

Temperament as Affecting Philosophic Thought: BROTHER CHRYSOSTOM.

It is impossible either to understand the great philosophers or to appreciate their influence if we limit ourselves to a purely scientific standpoint. Temperament enters so largely as a factor both in determining the principles on which they lay special stress and in gaining disciples for their respective schools, that we are forced to consider them also from a literary view-point if we would do them justice. The ingredients that form temperament may be arranged under the following heads: (1) Heredity, which is especially helpful in tracing tendencies favoring the pursuit of the concrete; (2) environment, which is closely interwoven with heredity and may be called a condition of its development as a factor in mental life; (3) race and nationality. No Frenchman will treat a subject in the same manner as a German; (4) the attraction exercised by the first philosopher who interests a thinker; (5) the time or epoch in which the philosopher lived; for history is governed to a great extent by the law of reaction and adjustment, which results in the formation of cycles of thought; (6) the personality of the founder. This leads him to lay emphasis upon certain phases of truth to the neglect of others. To estimate his influence we must attend to the elements of truth contained in his system of thought.

Are Mental Processes in Space? W. P. MONTAGUE.

The speaker protested first against the current paradoxical view of mental processes as real occurrences that occur nowhere. They should be located in space for the following reasons: (1) They are naturally felt to be within the body; (2) they form no exception to the generally accepted rule that an invisible event, such as an electric current, is to be located in the visible object that directly conditions it; (3) their phenomenal existence in space (like their existence in time) is not in conflict with the transcendental view that space and time are appearances; (4) that they are neither punctiform nor figured is no argument against their location in space, for many things—notably, sounds and odors—are definitely located in space without being regarded as either punctiform or figured; (5) the objection that there is no room in space for anything but matter and motion, and that thoughts and feelings if they were really in the brain would have to be regarded as visible substances between or alongside of the brain molecules, is invalid, for it disregards the fact that sensations are intensive and not extensive, and that they must, therefore, occupy space in the same way as other intensities, such as stresses, velocities and accelerations, which exist in space *along with* their matter and not *alongside* of it.

The last part of the paper explained and defended the hypothesis that mental states are the modes of potential energy (expressible in terms of the higher derivatives of space with regard to time) into which the kinetic energy of the nerve currents must be transformed in order to be redirected. The theory, if true, would justify the belief in interaction without violating the parallelists' contention that the spatial can only be causally related to what is in space.

R. S. WOODWORTH,
Secretary.

REVIEWS AND ABSTRACTS OF LITERATURE

Das Farbenempfindungssystem der Hellenen. W. SCHULTZ. Leipzig: J. A. Barth. 1904. Pp. 227; 3 colored tables.

This book returns to the old subject, discussed several decades ago by Gladstone, Geiger, Magnus and their opponents, of the color sense of the Greeks as revealed in their use of color names. The author, primarily a philologist, has informed himself regarding the psychology of color, and stands in this respect on a distinctly higher level than his predecessors. His studies lead him also to quite a different conclusion from the famous one of Geiger and Magnus, for whereas the older authors hold that the Greeks, at the dawn of their history, sensed red and yellow only, and only slowly developed a sense for green and blue, Schultz rejects the notion of such a development, since he finds the same looseness of color naming to